



Johnson Controls, Inc.
Control Products Division

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Series T53 Low Voltage Digital Setback Thermostats for Heating and Heating-Cooling Applications

Application

T53 24 V. A.C. thermostats are operating controls which provide one or two periods of temperature setback for energy conservation. The T53CEA is for use on combination heating-cooling applications. The T53ABA is used on heating only applications. The T53FEB is used for two stage heating — single stage cooling applications.

All Series T53 thermostats are designed for use only as operating controls. An operating control is not authorized for use where its failure in any mode can result in personal injury and/or loss of property. It is the responsibility of the user to add those necessary devices that protect against undesirable system failure modes.

Installation

Location

The thermostat should be mounted 4 to 5 feet above the floor in a location where it will be subjected to and affected by average room temperature. The thermostat must not be mounted where it may be affected by heat from lamps, sunlight, fireplaces, registers, radiators, pipes, etc., or by cold from windows, doors, registers, pipes, etc.

Wiring

All wiring must conform to local and national electrical codes and regulations.

CAUTION: Disconnect the power supply before wiring connections are made to prevent possible electrical shock or damage to equipment.

1. Make certain the proper thermostat has been selected.



Fig. 1 — Exterior view of the T53CEA Heating-Cooling Thermostat.

(T53CEA for heating-cooling application, T53ABA for heating only application, or T53FEB for two stage heating — single stage cooling applications.)

2. Remove the existing thermostat from its subbase so the wiring terminals are exposed.
3. The following wiring information applies to *all* models of the T53 thermostat:

Two-Transformer Heating-Cooling Systems

Some systems employ two transformers for the heating and cooling sections. In this case, two red wires, usually designated as "RH" (heating) and "RC" (cooling) will be present. Should this be the case, the transformers should be phased. Proceed as follows:

- a. Label the two wires correctly as either "RH" or "RC." Most thermostats carry these designations.
- b. Install the new T53 as outlined in the instruction sheet.

- c. With power available to the T53, check for voltage across the "W" and "Y" terminals. If:

- A reading of 0 volts is observed, complete the rest of the installation.
- A reading of approximately 48 volts is observed, reverse the leads from one transformer at the thermostat terminals (either "RC" and "Y" or "RH" and "W"). This action will phase the two transformers.

Power Requirements

The heating and air conditioning control circuits must both be 18 to 30 V. A.C. Since the T53 draws a small amount of power from the air conditioning control circuit during heating and vice versa, power must be left on to *both* control circuits at *all times*. If there is no air conditioning circuit, the heating-only model must be used. The load must be a minimum of .15 and a maximum of 1.5 Amps.



Fig. 2 — Open the thermostat by carefully pulling the front housing. Deforming contact pins may cause improper operation.

Johnson Controls Electronic Ignition Control Systems

A resistor harness assembly with double quick-connect terminals is included with each thermostat. When the T53 is used with any Johnson Controls electronic ignition control system (G60, G65 or G66) this harness assembly must be connected between terminal "2" and one of the ground "GR" terminals on the ignition control. When the ignition control is a G60() () K type, the resistor harness should be connected between terminals "2" and "6." However, on installations which use a Y79ABC or Y79AAB external lockout module, the harness assembly must be connected between terminal "THS" on the Y79 and one of the ignition control's ground "GR" terminals.

Note wire colors and terminal designations and, if different than those shown below, tag as follows:

T53ABA-1 (CSA58A-600)

R — Common
W — Heating system.
G — Fan — this can be used, if required.

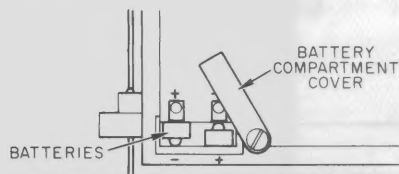


Fig. 3 — Interior view of back side of front housing. Note battery compartment and cover.

T53CEA-1 (CSA58A-601)

R — Common
W — Heating system.
Y — Cooling system.
G — Fan or fan relay.

T53FEB-1 (CSA58A-602)

R — Common
W₁ — First stage heating system.
W₂ — Second stage heating system.
Y — Cooling system.
G — Fan or fan relay.
EF — An internal wiring point for fan operation. See comments following Step 7.

NOTE: The T53FEB thermostat may be used on single stage heating-single stage cooling applications by simply not wiring up terminal W₂.

4. Be sure power supply has been disconnected. Remove wires from the subbase wiring terminals.
5. Remove the subbase from the wall by removing the mounting screws.
6. Open the T53 by carefully pulling apart the end opposite the hinges. (See Fig. 2.) Swing the thermostat completely open so terminal screws and mounting holes are accessible.
7. Insert all the wires through the wiring access hole in the back of the T53. Mount the T53 to the wall using the mounting holes and screws provided. (See Fig. 4.)

Connect the wires to the correspondingly labeled terminals

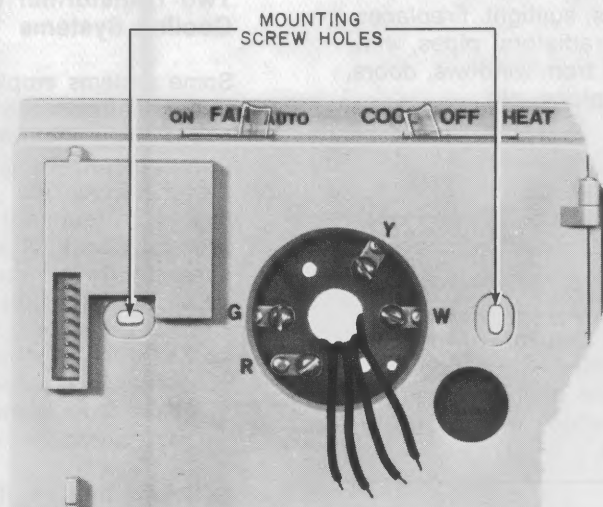


Fig. 4 — Interior view of mounting subbase. Note mounting screw holes and wiring opening.

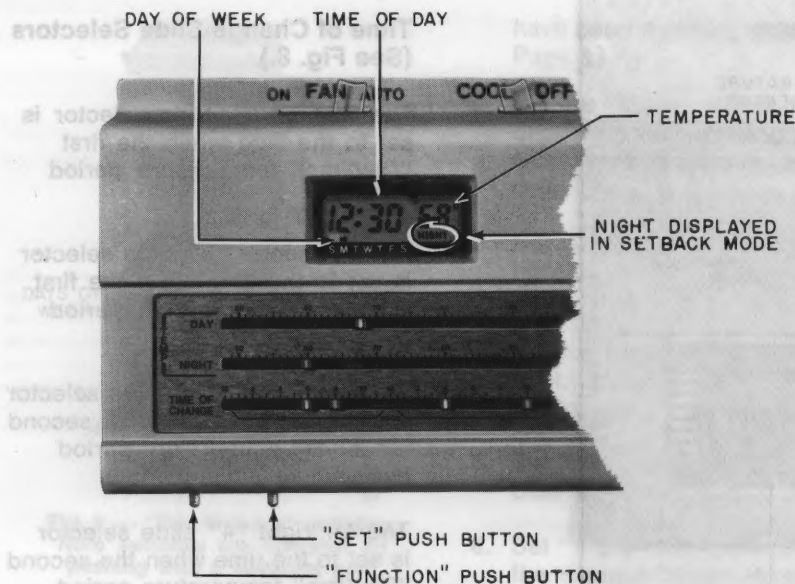


Fig. 5 — Front view of thermostat showing clock display and clock setting push buttons.

on the T53 (see comments in Step 3). Push any excess wire back into the wall.

NOTE: The wire connected to terminal EF on the T53FEB model thermostat should be left as is if the fan is energized by the thermostat on a call for heat. (Most electric heat appliances operate in this manner, but the equipment's wiring diagram should be reviewed for proper installation.)

If the fan is energized, on a call for heat, by an appliance control such as a fan and limit device, the wire should be disconnected from terminal EF and secured under the right mounting screw. (Most gas heat appliances operate in this manner, but the equipment's wiring diagram should be reviewed for proper installation.)

Optional Batteries

When the T53 thermostat is used with hydronic systems or with oil fired equipment, use of the Y99AX optional battery pack is strongly recommended. (See Fig. 7.) In areas where several power outages annually are expected, use of the battery pack is also suggested.

In areas where infrequent power outages occur, two 1.5 volt batteries may be inserted into the battery compartment. (See Fig. 3.)

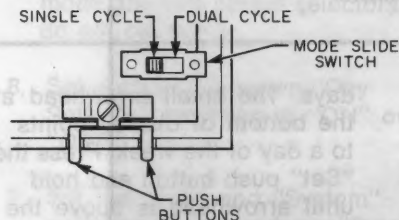


Fig. 6 — Interior view of back side of front housing. Note "Mode" slide selector.

Approved batteries include: Union Carbide #393 and Mallory #10L123. When the batteries are used, they should be replaced every two years to prevent corrosion damage to the thermostat. (When the small batteries are installed in the battery compartment and a power outage occurs, the display may read incorrectly. It will read

properly with the correct time when the power is restored.)

NOTE: If a power outage should occur and no batteries are used, the thermostat's digital display will go blank. When power is restored the display will reset and remain at 12:30 A.M. After 2½ minutes it will control the building's temperature to the 12:30 AM time setting, most likely the "NIGHT" temperature.

Adjustments

Setting the Temperature Program

Mode Switch (See Fig. 6.)

The mode slide switch is located in the lower right corner inside the front housing. It determines whether there will be one or two periods of temperature setback/setup in each 24 hour period. Set as follows:

Single Mode

Set switch in the left position for one setback/setup period during each 24 hour period.

Dual Mode

Set switch in the right position for two setback/setup periods during each 24 hour period.

Setting the Clock's Digital Display

The clock must be set after the thermostat is installed, and must also have to be reset anytime the front housing has been opened.

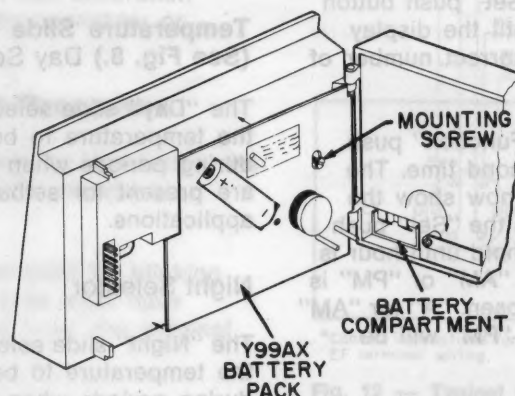


Fig. 7 — A Y99AX Battery Pack installed in a T53 Thermostat.

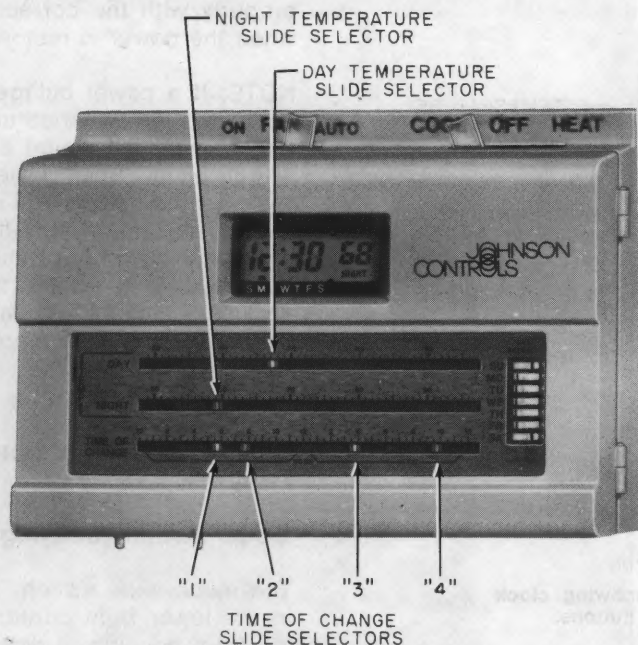


Fig. 8 — Front view of thermostat showing slide selectors.

Restore 24 V. A.C. power to the thermostat.

Setting the digital display is easy. Settings must be made with the front housing completely closed. (See Fig. 5.) The digital display shows the time, day of the week and temperature. "Night" is displayed when the thermostat is in the setback mode.

The "Function" push button selects the clock function (hours, minutes and day of week) to be set.

The "Set" push button advances the time and day of the week.

1. Press the "Function" push button once and release. The display will show the minutes. Press the "Set" push button and hold until the display shows the correct number of minutes.
2. Press the "Function" push button a second time. The display will now show the hours. Press the "Set" push button and hold until hour is correct and "AM" or "PM" is correctly chosen. "A" for "AM" and "P" for "PM" will be displayed.
3. Press the "Function" push button a third time to set the

days. The small arrowhead at the bottom of display points to a day of the week. Press the "Set" push button and hold until arrowhead is above the correct day of the week.

4. Press the "Function" push button a fourth time. Hours, minutes, and day of week will be displayed. If the colon between the hour and minutes is
 - blinking, settings are complete and clock is running.
 - not blinking, press the "Set" push button once more to start the clock. The colon should now blink. The clock is running.

Temperature Slide Selectors (See Fig. 8.) Day Selector

The "Day" slide selector is set to the temperature to be maintained during periods when occupants are present for setback applications.

Night Selector

The "Night" slide selector is set to the temperature to be maintained during periods when occupants are absent or asleep for setback applications.

Time of Change Slide Selectors (See Fig. 8.)

The far left "1" slide selector is set to the time when the first "Daytime" temperature period begins.

The left center "2" slide selector is set to the time when the first "Daytime" temperature period ends.

The right center "3" slide selector is set to the time when the second "Daytime" temperature period begins.

The far right "4" slide selector is set to the time when the second "Daytime" temperature period ends.

NOTE: When "Single Mode" operation is chosen only the far left "1" and far right "4" slide selectors are operable. Center "2" and "3" slide selectors do not operate.

IMPORTANT — Before the temperature and time of change slide selectors are set, move each selector the full length of the scale at least two times to be sure contacts are free from foreign particles.

Do not set the time and temperature selectors at increments of less than one half hour or one degree. Be sure selectors are seated in the appropriate notches.

Examples:

Set the "time of change" selector to 7:00 or 7:30 A.M. but *not* 7:15 A.M.

Set the temperature selector to 70°F or 71° but *not* 70.5°F.

Improper operation may result if these instructions are not followed.

Day "Setback" Selectors (See Fig. 9.)

One switch is provided for each day of the week. Each switch is operated by pressing with a ballpoint pen. **NOTE:** A switch is turned "ON" by pressing its left side.

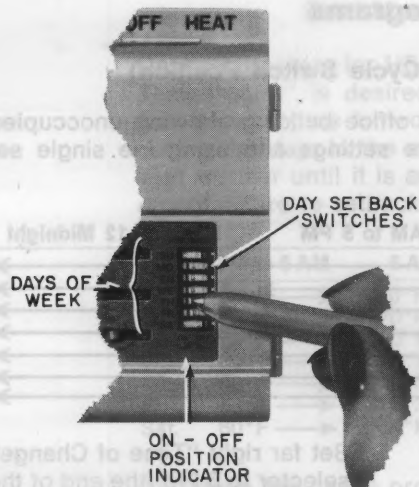


Fig. 9 — "Day Setback" switches.
Note switches are operated by pushing with a ballpoint pen.

When the day "Setback" switch is pressed to the "OFF" position during:

Single Mode Operation

The "Night" temperature is maintained for the entire 24 hour period of the day chosen.

Dual Mode Operation

There is no setback during the day on the day chosen. "Daytime" temperature is maintained from the beginning of the first daytime temperature period to the end of the second daytime temperature period.

To set the thermostat, proceed as follows:

1. Carefully pull open the front housing. (See Fig. 2.)

NOTE: The time display will reset to 12:30 after thermostat is closed unless two batteries

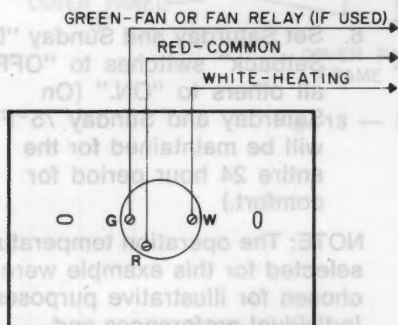


Fig. 10 — Typical wiring diagram for a T53ABA Heating Thermostat.

have been installed. (See Page 3.)

2. Set the "Mode" switch to the desired mode of one or two setback/setup periods each day. (See Fig. 6.)
3. Carefully close the T53 front housing. Press front until it snaps shut.
4. Set the digital display for hours, minutes, and day of the week.
5. Set "Day" slide selector to the desired temperature.
6. Set "Night" slide selector to the desired temperature.
7. Set the four "Time of Change" slide selectors to the desired times. (When set for single mode, the two center selectors do not operate.)
8. Set each of the seven "Day Setback" switches to "ON" or "OFF."
9. Set the "Fan" and "System" switches to desired positions. (See Fig. 8.)

NOTE: If you plan to be away from home for extended periods, set both "Day" and "Night" temperature selectors to the same temperature. Settings such as 80°F during summer absences or 60°F during winter absences are common. The T53 will then control at this temperature 24 hours a day regardless of other settings.

Calibration

The T53 thermostat is factory calibrated. Field calibration should not be necessary or attempted.

Checkout Procedure

Before leaving the installation, the following points should be checked:

1. The colon must be blinking and the time must have advanced from the original setting.
2. The thermostat should display the room temperature,

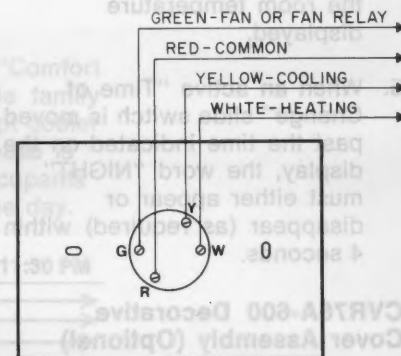
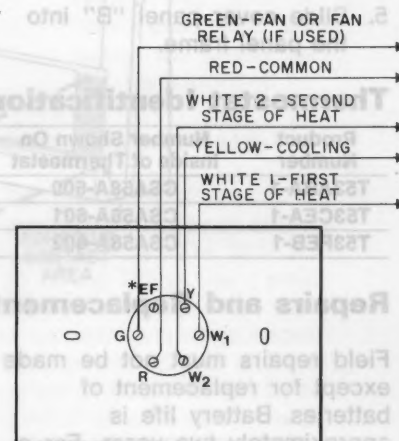


Fig. 11 — Typical wiring diagram for a T53CEA Heating-Cooling Thermostat.

although it may initially be higher due to handling during the installation.

3. Set the system switch at the HEAT position. The heating system must come on when the appropriate temperature slide switch is moved to a setting higher than the room temperature displayed, and must go off when the switch is moved to a setting lower than the room temperature displayed.
4. Set the system switch at the COOL position (where applicable). The cooling system must come on when the appropriate temperature slide switch is moved to a setting lower than the room temperature displayed, and must go off when the switch is moved to a setting higher than



*Consult instructions for information regarding EF terminal wiring.

Fig. 12 — Typical wiring diagram for a T53FEB two stage heating — one stage cooling thermostat.

the room temperature displayed.

- When an active "Time of Change" slide switch is moved past the time indicated on the display, the word "NIGHT" must either appear or disappear (as required) within 4 seconds.

CVR76A-600 Decorative Cover Assembly (Optional)

To install selector cover, proceed as follows:

- Clean the adhesive contact areas (See Fig. 13) with a cloth dampened with dishwashing soap and water. Rinse the areas with a damp cloth (no soap) and dry thoroughly.

CAUTION: DO NOT get any moisture or soap near the slide selectors or the setback switches. DO NOT use a spray cleaner under any circumstances. Moisture in the switches may damage the thermostat and cause improper operation.

- Remove the two adhesive backing strips from cover panel frame "A."
- Carefully place the cover panel frame on the front of the thermostat in the proper position.
- Firmly press the panel frame to secure in place.
- Slide cover panel "B" into the panel frame.

Thermostat Identification

Product Number	Number Shown On Inside of Thermostat
T53ABA-1	CSA58A-600
T53CEA-1	CSA58A-601
T53FEB-1	CSA58A-602

Repairs and Replacement

Field repairs must not be made except for replacement of batteries. Battery life is approximately two years. For a replacement thermostat, contact the nearest Johnson Controls wholesaler.

Typical Programs

Single Mode (Single Cycle Switch Position)

A typical HEATING program for an office building showing unoccupied and occupied time and temperature settings and using the single set back mode.

	12 Midnight to 8 AM	8 AM to 5 PM	5 PM to 12 Midnight
Sun.	60°F		
Mon.	60°F	70°F	60°F
Tues.	60°F	70°F	60°F
Wed.	60°F	70°F	60°F
Thur.	60°F	70°F	60°F
Fri.	60°F	70°F	60°F
Sat.	60°F		

To obtain the above program:

- Set "Mode" switch to single cycle position. (The temperature is *set back once*, between 5 PM and 8 AM.)
- Set "Day" temperature selector to 70°F.
- Set "Night" temperature selector to 60°F.
- Set far left "Time of Change" selector to 8 AM (the beginning of the "Daytime" temperature period).

- Set far right "Time of Change" selector to 5 PM (the end of the "Daytime" temperature period).

- Set Saturday and Sunday "Day Setback" switch to "OFF," all others to "ON." (On Saturday and Sunday 60°F temperature will be maintained for the entire 24 hour period while the building is unoccupied.)

NOTE: The operation temperatures selected for this example were chosen for illustrative purposes. Individual preferences and requirements may dictate different selections.

Desired program for COOLING so the home is not kept air conditioned during the week when occupants are at work. Cooling is provided at other times such as evenings and the weekend. Typical for homes.

	12 Midnight to 7:30 AM.	7:30 AM to 3:30 PM	3:30 PM to 12 Midnight
Sun.	75°F		
Mon.	75°F	80°F	75°F
Tues.	75°F	80°F	75°F
Wed.	75°F	80°F	75°F
Thur.	75°F	80°F	75°F
Fri.	75°F	80°F	75°F
Sat.	75°F		

To obtain the above program:

- Set "Mode" switch to single cycle position. (The temperature is *set up once*, between 7:30 AM and 3:30 PM.)
- Set "Day" temperature selector to 80°F.
- Set "Night" temperature selector to 75°F.
- Set far left "Time of Change" selector to 7:30 AM (the beginning of the "Daytime" temperature period).

- Set far right "Time of Change" selector to 3:30 PM (the end of the "Daytime" temperature period).

- Set Saturday and Sunday "Day Setback" switches to "OFF," all others to "ON." (On Saturday and Sunday 75°F will be maintained for the entire 24 hour period for comfort.)

NOTE: The operation temperatures selected for this example were chosen for illustrative purposes. Individual preferences and requirements may dictate different selections.

Dual Mode (Dual Cycle Switch Position)

Desired program for HEATING: During the week when warmer "Comfort Temperature" is desired for a short time in the morning while family members prepare for work and other activities. The house is kept cooler during the day. In the afternoon and during the evening the house is kept warmer until it is again setback during sleeping hours. Occupants do not desire to setback the temperature on weekends during the day.

	11:30 PM to 6 AM	6 AM to 8:30 AM	8:30 AM to 3 PM	3 PM to 11:30 PM
Sun.	60°F →	70°F →		
Mon.	60°F →	70°F →	60°F →	70°F →
Tues.	60°F →	70°F →	60°F →	70°F →
Wed.	60°F →	70°F →	60°F →	70°F →
Thur.	60°F →	70°F →	60°F →	70°F →
Fri.	60°F →	70°F →	60°F →	70°F →
Sat.	60°F →	70°F →		

To obtain the above program:

1. Set the mode switch to dual cycle position. (The temperature is set back twice.)
2. Set "Day" temperature selector to 70°F.
3. Set "Night" temperature selector to 60°F.
4. Set far left "Time of Change" selector to 6 AM (temperature is raised at 6 AM).
5. Set left center "Time of Change" selector to 8:30 AM (temperature is lowered at 8:30 AM).
6. Set right center "Time of Change" selector to 3 PM
7. Set far right "Time of Change" selector to 11:30 PM (temperature is lowered at 11:30 PM).
8. Set Saturday and Sunday "Day Setback" switches to "OFF," all others to "ON." (On Saturday and Sunday, the higher temperature is maintained throughout the day from 6 AM to 11:30 PM.)

NOTE: The operation temperatures selected for this example were chosen for illustrative purposes. Individual preferences and requirements may dictate different selections.

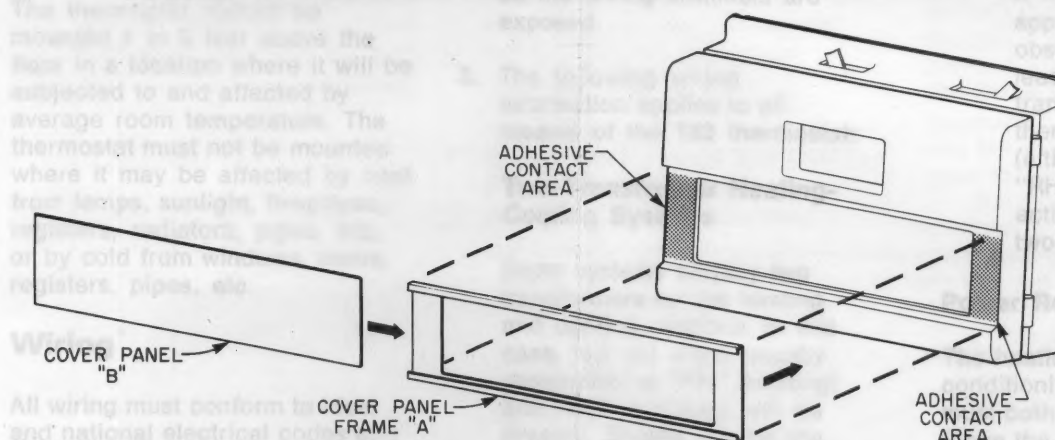


Fig. 13 — Method of installing the cover to the T53.

CAUTION: Disconnect the power supply before wiring connections are made to prevent possible electrical shock or damage to equipment.

1. Make certain the proper thermostat has been selected.

the room temperature most often displayed.

Basic Mode (Basic Switch Position)

- When an active "Time of Change" selector is set for a short time in the morning while family members are still asleep, the thermostat will keep the room temperature at the set point until the time indicated on the display. The word "NIGHT" will be displayed. The word "NIGHT" must disappear before the display will change to the set point. (Required for 4 seconds.)

CVR76A-500 Decorative Cover Assembly (Optional)

To install selector tabs, as follows:

Time of Day	Temp	Temp	Temp	Temp	Temp
11:00 PM to 2:00 AM	70°F	70°F	70°F	70°F	70°F
2:00 AM to 5:00 AM	70°F	70°F	70°F	70°F	70°F
5:00 AM to 8:00 AM	70°F	70°F	70°F	70°F	70°F
8:00 AM to 11:00 PM	70°F	70°F	70°F	70°F	70°F

- Clean the adhesive contact areas (See Fig. 13) with a cloth dampened with dishwashing soap and water. Rinse the area with a clean cloth (no soap) and dry thoroughly.

CAUTION: DO NOT get any moisture on the thermostat or the selector tabs. DO NOT use a spray cleaner under any circumstances. Moisture in the switches may damage the thermostat and cause improper operation.

- Set the mode switch to dual cycle position. (The selector is set back twice.)
- Set the "Night" temperature selector to 70°F.
- Set the "Daytime" temperature selector to 75°F.
- Set the "Time of Change" selector to 8:00 AM.

- Remove the two adhesive backing strips from covers and panel frame.

NOTE: The operation temperatures selected for this example were chosen for illustrative purposes. Individual preferences and requirements may dictate different selections.

- Carefully place the cover panel frame on the front of the thermostat in the proper position.

Change selector to 8:00 AM. (Temperature is lowered at 8:00 AM.)

- Press down the cover panel to secure it in place.
- Slide cover panel "B" into the panel frame.

Time of Day	Temp	Temp	Temp	Temp	Temp
11:00 PM to 2:00 AM	70°F	70°F	70°F	70°F	70°F
2:00 AM to 5:00 AM	70°F	70°F	70°F	70°F	70°F
5:00 AM to 8:00 AM	70°F	70°F	70°F	70°F	70°F
8:00 AM to 11:00 PM	75°F	75°F	75°F	75°F	75°F

Thermostat Identification

Product Number	Model Number	On/Off Switch
TSASA-1	CSASA-601	On/Off Switch
TSCEA-1	CSCEA-601	On/Off Switch
TSFEB-1	CSFEB-601	On/Off Switch

Repairs and Replacement

Field repairs must not be made except for replacement of batteries. Battery life is approximately two years. For a replacement thermostat contact the nearest Johnson Controls wholesaler.

To obtain the above program:

- Set "Mode" switch to single cycle position. (The temperature is set up once.)
- Set "Day" temperature selector to 75°F.
- Set "Night" temperature selector to 70°F.
- Set far left "Time of Change" selector to 7:30 AM (the beginning of the "Daytime" temperature period).

- Set far right "Time of Change" selector to 3:30 PM (the end of the "Daytime" temperature period).

- Set Saturday and Sunday "Day" selector to "OFF."
- Set Saturday and Sunday "Night" selector to "ON."

NOTE: The operation temperatures selected for this example were chosen for illustrative purposes. Individual preferences and requirements may dictate different selections.